CLAIMS

1. An acousto-optical add/drop multiplexer (10) , comprising:

an acousto-optical switch (8) on a birefringent and photoelastic substrate (101), the acousto optical switch including

a first optical port (202) coupled to a first polarization splitter (104),

first acousto-optical polarization conversion region (U) including a first optical waveguide branch (119) optically coupled between the first polarization splitter and a second polarization splitter (110),

second acousto-optical polarization conversion region (L) including a second optical waveguide branch (120) optically coupled between the first polarization splitter and the second polarization splitter, and

second and third optical ports (203, 205) coupled to the second polarization splitter;

a first circulator (7) having, in order of rotation, an input port (7a), a switch port (7b) coupled to the first optical port, and an output port (7c);

a reflecting device (13) coupled to the second optical port.

2. The acousto-optical add/drop multiplexer of claim 1, further comprising a second circulator (12) having, in order of rotation, a filter port (12a) coupled to the third optical port, a drop port (12b), and an add port (12c).

3. The acousto-optical add/drop multiplexer of claim 1, wherein the first polarization splitter has cross and bar transmission respectively for orthogonal polarization components of received light.

4. The acousto-optical add/drop multiplexer of claim 1, further comprising:

a first transducer (123) within the acousto-optical switch acoustically coupled to the first polarization conversion region and to an RF source (6), the first transducer generating a first acoustic wave in the first polarization conversion region having a characteristic frequency determined by the RF source.

5. The acousto-optical add/drop multiplexer of claim 4, further comprising:

a second transducer (124) within the acousto-optical switch acoustically coupled to the second polarization conversion region and to the RF

source, the second transducer generating a second acoustic wave in the second polarization conversion region having the characteristic frequency with a propagation direction opposite to a propagation direction of the first acoustic wave.

6. The acousto-optical add/drop multiplexer of claim 1, wherein the reflecting device is coupled to the second optical port via an optical fiber.

7. The acousto-optical add/drop multiplexer of claim 1, wherein the reflecting device is integrated on the substrate at the second optical port.

8. The acousto-optical add/drop multiplexer of claim 7, wherein an edge of the substrate at the second and third optical ports is slant-polished and an optical waveguide (106) coupled to the second optical port within the substrate is positioned substantially normal to the edge.

9. The acousto-optical add/drop multiplexer of claim 1, further comprising:

a polarization-mode-dispersion compensator (9a) coupled between the reflecting device and the second optical port.

10. The acousto-optical add/drop multiplexer of claim 9, wherein the polarization-mode-dispersion compensator is a birefringent element.

11. The acousto-optical add/drop multiplexer of claim 10, wherein the birefringent element is one of a polarization-maintaining fiber and a birefringent crystal.

12. The acousto-optical add/drop multiplexer of claim 9, wherein the polarization-mode-dispersion compensator is one of a Faraday rotator and a quarter-wave plate.

13. The acousto-optical add/drop multiplexer of claim 2, further comprising:

a first polarization-mode-dispersion compensator (9a) coupled between the filter port of the second circulator and the third optical port of the switch; and

a second polarization-mode-dispersion compensator (9b) coupled between the switch port of the first circulator and the first optical port of the switch.

14. The acousto-optical add/drop multiplexer of claim 2, further comprising

a second acousto-optical switch (8') formed on the same substrate as the acousto-optical switch, including

a fourth optical port (203') coupled to the drop port of the second circulator,

third and fourth polarization conversion regions (U, L) optically coupled between third and fourth optical polarization splitters, and

a fifth optical port (204) coupled to the fourth optical splitter.

15. The acousto-optical add/drop multiplexer of claim 14, further comprising

a third acousto-optical switch (8") formed on the same substrate as the acousto-optical switch, including

a sixth optical port (205") coupled to the add port of the second circulator,

fifth and sixth polarization conversion regions (U, L) coupled between fifth and sixth optical polarization splitters, and

a seventh optical port (202") coupled to the fifth optical splitter.

16. A wavelength selective optical cross-connect, comprising:

at least two acousto-optical switches (8, 8'), each including, on a birefringent and photoelastic substrate

a first polarization splitter,

a wavelength-selective polarization conversion stage (U, L) including first and second optical waveguide branches coupled between the first polarization splitter and a second polarization splitter,

a reflecting device (13, 13') coupled to one arm of the second polarization splitter, and

a circulator (7, 7') having, in order of rotation, an input port (7a, 7a') for receiving line channels, a switch port (7b, 7b') coupled to the first polarization splitter, and an output port (7c, 7c') ; and

an optical path coupling second arms of the second polarization splitters in the respective acousto-optical switches.

17. The wavelength selective optical cross-connect of claim 16, wherein

the two acousto-optical switches each have only one optical port connected to the first polarization splitter.

18. An acousto-optical waveguide device (8) selective in wavelength, comprising:

a birefringent and photoelastic substrate (101);

a wavelength-selective polarization conversion region (108) including first and second acoustic waveguides (121, 122) and first and second optical paths (119, 120);

a first polarization splitter (104) coupled between one end of the first and second optical paths and only a first optical interface (202) for the device; and

a second polarization splitter (105) having

input arms (114, 113) coupled to an opposite end of the first and second optical paths

a first output arm (118) coupled to a second optical interface (205) for the device and a second output arm (117),

a reflecting device (13) coupled to said second output arm.

19. A method of multiplexing optical channels, comprising the steps of:

providing a line optical channel at a first wavelength to an acousto-optical switch (8) having a first polarization splitter (104) and a polarization conversion stage (108) connected between the first polarization splitter and a second polarization splitter (105);

switching said line optical channel to a first arm (117) of the second polarization splitter;

reflecting said line optical channel back through the switch via the first arm;

adding to a second arm (118) of the second polarization splitter a new channel at a wavelength different from said first wavelength; and

combining the new channel and the line optical channel at an output of the switch (202) coupled to the first polarization splitter.

20. The method of claim 19, wherein the adding step includes the substep of:

separating said new channel from a different plurality of optical channels in another acousto-optical switch.

21. A method of dropping optical channels, comprising the steps of:

providing a plurality of optical channels to an acousto-optical switch (6) having a first polarization splitter (104) and a polarization conversion stage (108) connected between the first polarization splitter and a second polarization splitter (105);

switching at least one of the optical channels to a first arm (118) of the second polarization splitter and other of the optical channels to a second arm (117) of the second polarization splitter;

reflecting the other of the optical channels back through the switch via the second arm;

dropping said at least one of the optical channels from said first arm of the second polarization splitter.

22. The method of claim 21, wherein the dropping step includes the substep of:

passing the at least one of the optical channels to another acousto-optical switch for addition to a different plurality of optical channels.

Add A3